THE OFFICE ACTION

In the office action issued on May 5, 2005, the Examiner rejected claims 1-9, 11, 14-23, 25, 28-39, 41 and 44-46 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6, 597,108 to Yano et al. ("Yano") in view of U.S. Patent No. 6,016,012 to Chantila et al ("Chantila"). The Examiner further rejected claims 1-7, 9-10, and 12-13 as being unpatentable over U.S. Patent No. 4,188,565 to Mizukami et al. ("Mizukami") in view of Chantila.

The Examiner indicated that claims 24, 26-27, 40, 42 and 43 contained allowable subject matter and would be allowed if rewritten in independent form.

REMARKS

Applicant has carefully reviewed the office action. Applicant respectfully requests reconsideration of the application based on the above amendments and the following comments. Claims 1-46 remain pending in the application.

I. The Present Claims are Patentable Over Yano in View of Chatila

Claims 1-9, 11, 14-23, 25, 28-39, 41 and 44-46 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Yano in view of Chantila. The Applicants respectfully traverse.

As detailed in our previous response, Yano discloses a thick dielectric EL display having an upper thin film dielectric layer of SiON in contact with an alkaline earth thioaluminate, thiogallate or thioindate phosphor film. In contrast, the present invention recites a silicon oxynitride layer with a specific formula that has been demonstrated to improve the operating life of the display. The advantages of the present passivating layer are taught on pages 7 and 10 of the description where it is described that such a layer minimizes migration of oxygen into the phosphor, which has been determined to cause performance degradation.

Chatila, on the other hand, teaches the use of silicon oxynitride layers as a dielectric barrier layer for silicon based semiconductor devices. Nowhere does it disclose or suggest the use of silicon oxynitride layers in contact with or directly

adjacent to an alkaline earth thioaluminate phosphor film, as recited in the present application.

To properly combine references under §103, there must be some suggestion or motivation to combine the teachings of the two references. Here there is none. The utility of a silicon oxynitride layer in any application is dependent on the substrate on which it is deposited, and it cannot be inferred that a silicon oxynitride would be viable in contact with a barium thioalumianate layer on the basis of Chatila's teaching of the use of such a layer in contact with electrically conductive films or conductive (doped) regions of a silicon single crystal. That is, Chatila's use of a silicon nitride layer in contact with an electrically conductive film or conductive regions would not suggest to one skilled in the art to use such layers with the phosphor films of Yano because there is no indication that such a combination would produce an acceptable result or be successful. On this matter, the Examiner will appreciate that to properly combine the teachings of two or more references, there must be a likelihood or some indication that such references could be successfully combined.

In this respect, specific issues to be considered in determining the viability of a silicon oxynitride layer on a substrate comprising a different material include, among others, the chemical reactivity of the two materials, the adhesion strength of the silicon oxynitride layer on the substrate material, the mechanical stress at the interface between the two materials due to different thermal expansion coefficients and other factors and, in the case of the display application, and the difference in optical index of refraction between the two materials. Here, there is no teaching in either Chatila or Yano that the silicon oxynitrides of Chatila could be successfully combined and used with the phosphors of Yano.

Thus, because there is no motivation to combine the teachings of the two references, the proposed combination of Yano and Chatila is improper.

In contrast to Yano, wherein the SiON layer is strictly used only as a dielectric layer in the EL displays therein, the present invention discloses the use of silicon oxynitride as a passivating layer, while also being suitable for use as a top thin film dielectric layer, as well as a thin film layer on the bottom side or on both sides of the phosphor film. This is not taught or suggested by Yano.

As previously noted, Yano fails to teach the specific ratios of elements in the claimed silicon oxynitride, nor the inclusion of hydrogen in the silicon oxynitride.

Furthermore, as detailed above, the silicon oxynitride layer of the claimed invention primarily serves the function of a chemical barrier (passivating) layer but may also serve as a thin dielectric layer. There is no need for an additional upper thin film dielectric layer. Claim 1 recites the formula $Si_3N_xO_yH_z$ with x between 2 and 4, y between 0 and 2, and z between 0 and 1. This excludes Yano's nominal composition of SiON or even SiN if these are taken to be a true chemical formula. With this interpretation Yano's composition corresponds to $Si_3N_3O_3$, where x = 3, y =3 and z = 0. This is outside of our claimed composition ranges for x, y and z.

The Examiner states that "Applicant's specification does not provide a clear regard to unexpected results." Applicants disagree. As noted in our previous response, our specific silicon oxynitride formula provides the advantages as discussed on pages 7 and 10 of the description leading to minimal performance degradation of the phosphor during operation.

Yano neither teaches nor suggests the claimed formula or these advantages, which cannot simply be optimized and assumed that they would be provided by a silicon oxynitride with a different chemical formula. This is specifically discussed in the present application on page 2, last full paragraph, which states that silicon nitride (SiON) is not preferred for use as a barrier layer with thioaluminate phosphors. The chemical formula of the present silicon nitride provides for its characteristics and changes thereto may lead to very different properties. There is simply no motivation for the use of the present silicon nitride nor is there any teaching suggesting that the present phosphor is analogous to or otherwise obvious in light of the use of a SiON dielectric layer. For obviousness the cited document must suggest that which is claimed. Here, Yano fails to do so.

In summary, Yano discloses a thick film dielectric device including a silicon oxynitride layer only on top of a thioaluminate phosphor. It does not disclose the claimed silicon oxynitride formula, nor providing the material on top and/or bottom of the phosphor layer. Likewise, Chatila discloses silicon nitride that may fall within our formula but in a different type of display. Chantila also doesn't suggest using it with our claimed phosphor or the phosphor of Yano in a thick film dielectric display.

II. The Present Claims are Patentable Over Mizukami in View of Chatila

Claims 1, 9, 10, 12 and 13 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Mizukami in view of Chantila. The Applicants respectfully traverse.

Mizukami teaches a thin film electroluminescent device. The disclosed phosphor material is manganese doped zinc sulfide. This differs from the presently claimed invention in that the present claims specify a rare earth activated alkaline earth thioaluminate phosphor. This excludes zinc sulfide. There is no motivation to combine Mizukami with Chatila because there is no indication that the silicon oxynitride of Chatila would be useful or functional with the electroluminescent device of Mizukami. Again, the utility of a silicon oxynitride dielectric layer in contact with an alkaline earth thioaluminate phosphor material cannot be predicted on the basis of the utility of a silicon oxynitride layer in contact with a zinc sulfide layer.

Another difference between the Mizukami device and the present invention is that the Mizukami device is a thin film electroluminescent device that is constructed from the viewing side up and does not have a thick dielectric layer. Thus the first silicon oxynitride dielectric layer taught by Mizukami is equivalent to the dielectric layer deposited on top of the phosphor in the present inventive device (i.e. between the phosphor layer and the ITO), not the dielectric layer on the bottom of the phosphor layer bottom. The issues regarding adhesion between the silicon oxynitride layer and the phosphor layer and internal stress in the two types of devices will be significantly different due to the different materials making up the laminated structure of the devices, the different coefficients of thermal expansion of the various layers and the different thermal process conditions and different order of processes to which the two types of device are subject.

In summary, Mizukami discloses silicon oxynitride layers on top and bottom of a ZnS phosphor. However, it doesn't disclose the specific claimed formula for the silicon oxynitride, or the claimed phosphor. Thus, even assuming the propriety of combining Mizukami with Chatila, such a combination would still not disclose or suggest the claimed phosphor layer.

CONCLUSION

In view of the above, Applicants submit the present application is in condition for allowance and respectfully request the rejections be withdrawn.

If any fee is due in conjunction with the filing of this response, Applicants authorize deduction of that fee from Deposit Account No. 06-0308.

Respectfully submitted,

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